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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/916,804 | 07/27/2001 | Yutaka Takeshima | P/1071-1392 | 2161 |

2352 7590 07/19/2002

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| EXAMINER | |
|---|---|
| BARR, MICHAEL E | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1762 | 4 |

DATE MAILED: 07/19/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

MF-4

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/916,804 | TAKESHIMA, YUTAKA | |
| | Examiner | Art Unit | |
| | Michael Barr | 1762 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) *15-18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *3* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-14, drawn to a method of forming a thin film, classified in class 427, subclass 79.

   II. Claims 15-18, drawn to an apparatus for forming thin film, classified in class 118, subclass 300.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions of Group I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus of Group II can be used to perform a materially different process other than that of Group I, such as application of cleaners to a substrate.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification and the search for one group is not required for the other group(s), restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Edward Meilman on July 3, 2002 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-14. Affirmation of this election must be made by applicant in replying to this Office action. Claims 15-18 are

withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

### *Claim Rejections - 35 USC § 112*

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-14 cite the limitation of a "thin film". "Thin" is a relative term which renders the claims vague and indefinite, as there is no clear definition provided to show what film thickness is considered to be thin.

Claim 1 cites the limitation of forming the film "on a substrate in the film-forming chamber to a temperature equal to ....". It is not clear from the claim if the temperature is referring to the temperature of the substrate or the chamber. Furthermore, it is not clear as to when said temperature is required. Is this temperature required then the atomized compound is applied to the chamber or can the temperature merely be achieved sometime after the compound is applied to the chamber?

### *Claim Rejections - 35 USC § 103*

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-3, 9, and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi et al. in view of Solayappan et al.

Hayashi et al. teaches forming a metal oxide film, such as a BST or SBT film, on a substrate by atomizing (misting/aerosol) a precursor solution containing at least three metal complexes (including a metal alkoxide) and a solvent having a boiling point greater than 100°C, under normal conditions, delivering the atomized precursor with a carrier gas to a vacuum chamber containing the substrate, where the temperature of the substrate can be at 100°C and the chamber can be at 100 Torr, and then forming the metal oxide film on the substrate by drying at 200-500°C and then annealing in an oxygen atmosphere at 500-1000°C (Col. 6, lines 27-55; Col. 7, line 1-Col. 8, line 64; Col. 10, lines 59-61; Col. 13, lines 30-39). Such heating temperatures would have been higher than the boiling point of the precursor solvent. The atomizing and delivery device of Hayashi et al. reads on the claimed two-fluid nozzle as it utilizes both the carrier and fluid precursor. Hayashi et al. teaches that the heat treatment occur while drawing a vacuum in the chamber (Col. 8, lines 37-64). This would suggest that the pressure is less in the chamber than during the deposition. Furthermore, the oxygen atmosphere in the annealing step would have provided a higher oxygen partial pressure than during the deposition step.

Hayashi et al. does not teach that the chamber pressure is 100 Torr or less. Solayappan et al. teaches forming a metal oxide film by atomizing the precursor solution and delivering the precursor to a vacuum chamber, in a process similar to that of Hayashi et al., where the vacuum in the chamber can be at 10 Torr (Col. 15, lines 47-67). It would have been obvious to one

skilled in the art to introduce the atomized precursor of Hayashi et al. into the deposition chamber, where the chamber is at a vacuum less than 100 Torr (i.e. 10 Torr), with the expectation of forming the desired metal oxide film on the substrate, since it is shown that such vacuum pressures are conventionally used in the art, as shown by the similar atomized precursor process of Solayappan et al.

Hayashi et al. further fails to teach that the carrier gas is oxidative. However, Hayashi et al. does teach that reactive gases can be used as a carrier gas for the atomized precursor (Col. 13, lines 30-38). Solayappan et al. teaches that the carrier gas for the atomized precursor can be oxygen (Col. 15, lines 45-50). It would have been obvious to one skilled in the art to use oxygen as the carrier gas in Hayashi et al., with the expectation of providing the desired delivery of the precursor and oxide film formation, as oxygen is a conventional reactive/oxidative carrier gas for such a atomized precursor carrier, as shown by the similar process of Solayappan et al.

Hayashi et al. fails to teach that the film forming occurs at least twice. Solayappan et al. teaches performing the oxide film formation consecutively with heat treatments between each deposition (Col. 28, lines 43-57). It would have been obvious to perform the oxide film deposition of Hayashi et al. twice with intermediate heat treatments, in order to provide the desired oxide film thickness, since the same is typical in the art, as shown by the similar process of Solayappan et al.

9. Claims 4-8 and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi et al. and Solayappan et al. as applied to claim 1 above, and further in view of Ogi et al.

Hayashi et al. and Solayappan et al. do not teach that the precursor utilizes dipivaloylmethanato and acetylacetonato complexes. However, such complexes containing the

claimed ligands are typical in precursors used for forming metal oxide films, such as the BST film of Hayashi et al.. Ogi et al. teaches forming a metal oxide film, such as BST, using a precursor solution, where dipivaloylmethanato and acetylacetonato complexes are known for used in such precursors (Col. 1, lines 16-34). It would have been obvious to one skilled in the art to use dipivaloylmethanato and acetylacetonato complexes in the precursor of Hayashi et al. and Solayappan et al., with the expectation of providing the desired metal oxide (BST) film, since it is shown by Ogi et al. that such complexes are conventionally used in precursors for such films.

## *Conclusion*

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. McMillan et al. teaches atomized precursor deposition of metal oxide films.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Barr whose telephone number is 703-305-7919. The examiner can normally be reached on Monday-Thursday 6:00 am-4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on 703-308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 or 703-305-5408 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Michael Barr
Primary Examiner
Art Unit 1762

MB
July 9, 2002